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The University of Jammu & Kashmir

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CONVOCATION ADDRESS

BY

Professor D. S. KOTHARI

Chairman, University Grants Commission, New Delhi

Monday, 21st October 1963

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JAMMU AND KASHMIR UNIVERSITY

CONVOCATION ADDRESS

Monday, 21st October, 1963

I feel it an honour and a privilege to participate in this Annual Convocation of the University of Jammu and Kashmir. This is a relatively new university. It was founded in the year 1948, and the first teaching departments established some seven years ago. It has been the university's good fortune to have Dr. Karan Singh as its Chancellor, and it owes much to his vision, generous support and devoted interest. The University had a great Vice-Chancellor in the distinguished scholar-diplomat Dr. K.M. Pannikkar. We are happy that he has been succeeded by an eminent educationist, Principal T.M. Advani, who brings to his great task wide experience and understanding, and we wish him all success in his challenging work. May I express the confident hope that under the distinguished leadership of the Chancellor and the Vice-Chancellor, and through the dedicated effort of its teachers and students, the university will make a notable contribution to higher education and research and to the progress of our country generally.

To the young men and women who have received their degrees and academic distinctions to-day, I offer my warm felicitations. I extend to them my best wishes for a happy and fruitful life.

We live in times of unusual stress and also of uncommon opportunities and possibilities to lift the country to a new level of prosperity and achievement. The question uppermost in our minds is: what should we do to make freedom endure? In the stirring words of the Prime Minister:

> Every generation has to fight anew the battle for freedom. Otherwise we grow soft and forget the basic values of life and freedom and tend to lose their essence. Now a chance comes to all of us and, more especially, to the young to test their mettle and their patriotism. Let this challenge

be considered an opportunity and be met with strength, dignity, discipline and fortitude, so that out of this trial a new and better India might be fashioned by the efforts and sacrifices of her children.

Improve Quality and Reduce Wastage

In the field of higher education the central problem facing us, which in a sense is basic to everything else, is to *improve quality and reduce wastage.* To progress in this direction it is necessary to take urgent and energetic steps to raise the quality and strength of the teaching staff, to make available good books at reasonable prices within easy reach of our students, and to provide 'reading seats' in libraries and 'day-students homes' for a substantial proportion of our students. And in whatever we do, the student must always be at the centre of our attention.

The problem of 'student wastage' is a serious one and it has been with us for a long time. Lord Curzon said more than fifty years ago in one of his addresses:

> When I find that at Madras in the past year, out of 7,300 persons who presented themselves for the Entrance University Examination, certified by their teachers to be fit for the higher courses of teaching, as many as four-fifths were rejected, I ask myself what the value of the school final courses can have been....and that, roughly speaking, of those who aspire to a University course, only 1 in 17 takes a degree, and of those who actually start upon it, only 1 in 9—I cannot but feel some suspicion as to the efficacy and the standards of a system which produces such results. Some might argue that tests which admit of so many failures must be too hard. I am disposed to ask whether the preceding stages are not too easy.

At our 1961 examinations the percentage of failures (averaged over the universities) was B.A. 53.6 (56.5); B.Sc. 54.7 (51.0); B. Com. 53.4 (53.3); M.A. 17.8 (17.8); M.Sc. 22.7 (20.1); M. Com. 17.3 (16.2); B. Sc. (Engg.) 26.0 (20.2); B. Ed. 17.5 (24.3); B.L. 42.2 (41.1); B. Sc. (Ag) 20.0 (21.4); B. Sc. (Vet. Sc.) 35.7 (34.4); B. Sc. (Tech) 16.3 (17.9) and M.B.B.S. 43.8 (43.3). The figures in brackets refer to the 1960 examinations.

Let us consider the broad picture of higher education in our country. The total enrolment in the universities, including Intermediate Boards, was about 1.3 million in 1962-63. Women students were 18 per cent of the enrolment. Of the total population the number of postgraduate students was 5.6 per cent, and the number of research students 0.5 per cent only. The number of students admitted to the different first-degree courses in 1962 were: 114,000 arts, 28,000 commerce, 80,000 science, 13,000 engineering and technology, 9,000 medicine, 8,000 agriculture, 1,200 veterinary science, 13,000 law and 26,000 teacher-training. In India one person in forty, in the relevant age-group, gets the benefit of higher education. The corresponding figure for U.S.A. is one in three: for the U.K. it is one in twelve.

If we take a group of ten students, selected at random, six out of them would be in arts, commerce and law, three in science and only one accounts for engineering, medicine and agriculture. In our country the proportion of students doing engineering, medicine and agriculture is relatively very small in comparison to the pattern in industrialised countries. For example, in the U.K. out of every ten students, four are in arts and commerce, three in science and three in engineering, medicine and agriculture.

Perhaps, the most important single factor in a complex of causes leading to high rates of failure, is that a considerable proportion of our students have inadequate facilities for home study and hardly ever find a place and time conducive to study and contemplation, free from petty worries and distractions, and undue demands for household chores. A large majority of students come from homes in which there is no background or tradition of academic work of any kind. Often they have to travel long distances from their homes to the university, with all the attendant stress and loss of time involved.

A low percentage of successful students reflects, apart from other things, a poor standard of instruction, and its impact on student morale and discipline cannot be ignored. Without properly tackling the 'wastage problem', a general increase, say, in science admissions, would mean considerable expense without comparable gain. The output of graduates is a product of the 'intake' and the 'efficiency' of the educational process. With improved teaching, better textbooks and their easy accessibility to students, more working days, closer contacts between teachers and students and some individual attention to students, it should be possible to reduce substantially the present high rates of failures at examinations. And an added gain would be improvement in standards, in student morale and in the 'general climate' of the universities.

Investment in Education

No investment these days is of greater significance than investment in education. A.N. Whitehead said: "in the conditions of modern life the rule is absolute: the race which does not value trained intelligence is doomed." We are now passing from the stage when university education was confined to a few—the elite—to a situation where an appreciable proportion of the population goes in for it. This is necessary to meet the increasing needs of industry and welfare services, and demands of security and defence. Though expenditure on education now constitutes a few per cent of the national income very little is known about the efficiency of the educational process. There has been little objective and scientific study of learning and teaching, of the utilisation of educational facilities and so on. Take the question of University admissions. It is generally felt that admissions to universities should be selective, and the assumption is usually made that with enough care and effort it should be possible to select the "right" students. Yet, as Sir Eric Ashby has observed in his brilliant and thought provoking Address this year to the British Association for the Advancement of Science—a 'must reading' for educationists and university men—"There is no right way and it is vain to seek one." As another illustration take the school-leaving age. F. Machlup (*The production and Distribution of Knowledge in the US*, Princeton 1962) has pointed, referring to American schooling, that what the child learns in 12 years between the ages of 6 and 18 could be learnt with improved schooling between the ages 5 and 15 by improving the efficiency of schooling. This saving in school-years might save the United States $ 10 billion a year (Rs. 5,000 crores a year).

Another matter of great interest and importance is the pupil-to-teacher ratio in the universities and colleges. It is about 17 to 1 in India. The corresponding figure for UK is 9 to 1. Incidentally, in the great ancient University of Nalanda the pupil-teacher ratio was 7 to 1. It had nearly 10,000 students and 1,500 teachers. (The university was something like an all-India institution for higher studies and research and in spite of its large size it was administered on democratic principles by the entire body of students.) There has been little systematic study on the question of optimum size for lecture classes, duration and organization of practical work, laboratory design and so on.

We should make more effective use of laboratories and libraries and class room space than is generally the case in most universities and colleges. The capital investment on buildings and equipment per science student in a university is of the order of Rs. 2,000. The corresponding figure for UK is £2,400 for Science and £3,500 for technology. All these questions need careful study and examination. Research into education should receive far more attention than has been the case so far. It provides a fertile field for the approach and techniques of operational research. Discussion of educational problems is often vitiated by our expressing the same old prejudices and preconceived notions, but in new terms and giving them a pseudo-scientific gloss.

Science and the Universities*

Mention of practical work and laboratories reminds us that the dominating characteristic of the modern world is science. In the contemporary world, rich countries are those which are rich in science and poor are those which are poor in science. This division of humanity into rich and poor is relatively a new thing, and has arisen because some countries have been fortunate to exploit science more fully than others: it is an unfortunate by-product of the Scientific Revolution. In the rich countries the economy is dynamic and in most of the poor, it is almost static. This implies that the gap between the rich and poor humanity is not only large but widening rapidly with time. Often the price of agricultural produce in the poor countries remains constant, whereas the price of industrial goods manufactured by the rich countries rises continually. This makes it all the more difficult for the developing countries to import the much needed capital equipment and machinery to raise their production. Such things tend to dilute, to a considerable extent, the impact of aid given to developing countries. It should be possible, of course, to devise ways which would overcome this and related difficulties, but this will require great vision and courageous statesmanship. The wide gap between the developed and underdeveloped world is detrimental to the real interests of both. The earnings of a proportion of our population equal to that of the total population of U.K. are no more than what the people of U.K. spend on cigarettes and tobacco. It is now established that smoking raises considerably the incidence of lung cancer. If what is spent on smoking by the rich world were passed on to the newly developing countries to assist their food production, it would benefit both. In this connection it is good to remember that the prosperity of the rich countries is due in no small measure to the contribution in material resources, craftsmanship and brains made by other countries. As an example of the uncommonly high level of handicrafts in India, we may recall Halley's (Secretary to the Royal Society) letter of 1686: "I have seen a great curiosity viz., a calicoe shirt brought from India, which is woven without a seam all of one piece, which I should have thought impossible had I not seen it. It explains the Scripture relation of our Saviours' coat which was without seam."

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*In this part of the Address I have drawn rather freely on Science Congress Address (1963).

Money spent on research and development is not an entirely satisfactory index of the development of science in a country. Much would depend upon the efficiency with which the resources are utilised. All the same, within limits, this is an index of considerable significance. The USA Government currently spends somewhat more than 2.8 per cent of the Gross National Product (GNP) on research and development and testing of new defence equipment. The amount is more than $15 billion, that is Rs. 7,500 crores per year. (Industry contributes an additional $5 billion or so.) More than three-fourths of the amount goes to work related to defence. The current level of research and development expenditure in our country is some 0.2 per cent of the GNP. In this context it is important to recognise that the research and development expenditure in countries which have passed the 'take-off' stage in science has been increasing very rapidly during recent decades: the doubling period is less than 10 years. About 20 years ago the USA, Government and Industry, spent about 0.5 per cent of GNP on research and development—it was 0.1 per cent in 1920. (In 1940 the Government spent $ 74 million, and $ 2 billion in 1953, on R and D.)

The USSR national budget on research in 1959 was 20 billion (current roubles, representing 2.8 per cent of the total national budget. It was 0.6 per cent in 1940. (*Dewitt: Educational and Professional Employment in the USSR, 1961*). China spent in 1960 on industrial and scientific research and technical development about 1.54 per cent (that is some $ 0.4 billion equivalent) of the total national budget. It was only 0.02 per cent in 1950. (J.M.H. Lindbeck, *The China Quarterly*, April-June, 1961.)

The UK Government in 1939 spent on scientific research £ 3.5 million; the current figure is £ 45 million, representing a four-fold increase in real terms. The total expenditure by government and industry on research and development was £ 300 million in 1956 and £ 630 million in 1962—a rise from 1.7 per cent of the GNP to 2.7 per cent. The present research and development budget exceeds the total government budget of some decades ago—In 1909 the total budget was about £150 million.

We can have more research only when there are more men to do it. In the USA the number of *professionally qualified scientists and engineers* constitute about 1.5 per cent of the population. In 1940 the percentage was 0.6 only. By 1970 it is expected to be 2 per cent. In the USSR the number of research and academic staff (university level) engaged in science and engineering was 354,000 in 1960, which was about 0.2 per cent of the total population. The corresponding figure for our country is of the order of 0.01 per cent. *There is a close and direct connection between the percentage of national income spent on research and development and the number of scientists and technologists expressed as a percentage of the total population.* We cannot have one high and the other low without leading to inefficiency and wastage. To do more science we need more scientists. Investment in sicence and investment in man go together. This has given a new status and a new significance to the place and role of the universities in national economy. In fact, the level of science and technology in the universities provides a reasonably good barometer to the standard and health of science and technology in the country.

Research and Teaching

The experience of more than a century, beginning with the great German Universities, has clearly shown that teaching and research flourish best in combination: in isolation they both wither. The best of either is achieved in an environment where both are cultivated. In this combination of teaching and research, education and discovery, lies the real strength of the universities.

In the UK about 50 per cent of the expenditure in the universities, as also the time of the teaching staff, is spent on research. The US Government in 1962 spent nearly $ one billion (Rs. 500 crores) on research and development in the universities. This was seventy times larger than the amount spent in 1940. A recent Report on 'Meeting Manpower Needs in Science and Technology' by the US President's Science Advisory Committee has strongly urged that in order to meet the nation's urgent needs the output of first degree holders in engineering. mathematics and physical sciences, as also the output of doctorates, be doubled by 1970. This would require a yearly expenditure of $ 8 billion ($ 2.7 billion on research) as against the present figure of $ 3 bilion. In 1961 about 645,000 students were enrolled in the USA for full-time courses in science and engineering, and the number of teachers was about 100,000. During recent years Federal Contracts have provided a considerable proportion of the income of most (privately endowed) universities in the USA: Thus for 1958-59 the percentage of total income was 66 per cent for the MIT (total income $ 101 million), 88 per cent for the California Institute of Technology and 59 per cent for the Chicago University. (M.K. Hubbert, *Science*, 8 March 1963).

There was a time a few hundred years ago when a gifted individual could encompass the whole of knowledge. This is no longer true today. It is hardly possible for any person today to master even one subject. The fragmentation of knowledge, if it is not to become a self-defeating process, has to be supplemented by cross communications cutting across subject barriers. There must be a continuing re-shuffling of boundaries between subjects. Fragmentation is artificial: knowledge, in a sense, is a unity.

Progress in education and research requires a 'climate' of free enquiry, frank and vigorous criticism and fearless expression of opinion. This becomes easier to organise, promote and foster if there are strong universities with front rank schools of postgraduate studies and research. It is important that a substantial proportion of the best men and leaders of thought in the country should be in the universities, in contact with and inspiring young minds and sharing in their joys and difficulties. Also every endeavour should be made to increase the proportion of men at the working bench to those at the administration desk: to raise the proportion of small and modest laboratories doing big work to big laboratories doing small work.

Creativity and Team Work

It is generally true that creativity of an individual continues longer in a university environment than elsewhere because of the continuing challenge of youth. A recent editorial in *Science* said—the path to new discovery for a scientist who has already made his reputation is often blocked by too much equipment, too much money, and too much seeking after status and security. There is (relatively) little danger of this happening in an Indian university.

In developing and promoting spirit of team work, the contribution of the universities is of special value. As Frederick Seitz, President of the U.S. National Academy of Sciences observed in a recent address: "What is emphasized here is that in the main the concept of team work in science has evolved most rapidly and most effectively through university channels during the past forty years."

When there is a deficiency of competent men, it is wiser to invest them generally in the universities, thus combining teaching and research. If the investment and effort exceed a certain critical size (and with proper feedback), it would generate a sort of chain process providing many more of more able men.

Strengthening Universities is Basic to Everything Else

Quality is important at all stages of education, but when it comes to postgraduate studies and research even the "second best" is not good enough—it will not do. We must go in for the best attainable. With our very limited resources high quality can only be ensured by concentration of resources. By coordination amongst the universities and by careful selection it should be possible to develop a modest number of 'centres of excellence'. In other words, one should aim at establishing high peaks—'centres of advanced study' in carefully selected subjects and universities. These centres would serve as 'breeders' for new centres of excellence. Concentration of effort in the initial stages is a vital thing for us. Also, there must be close cooperation between universities, national laboratories and other research organisations so that in the establishment of the centres fullest use is made of all available resources.

Everything possible should be done to strengthen the universities *e.g.*, improvement of teacher to pupil ratio, library and laboratory facilities, specially at the postgraduate and research level; this should be a key point in the plan and pattern of deployment of the country's resources in talent and facilities. In the context of the present meagre level of facilities, the layout on the universities should at least be doubled in five years. Strong postgraduate schools are our most urgent requirement; and to organise these effectively all available resources of the universities, national laboratories and other agencies would need to be pooled together.

In the universities, good work, good teaching and good research should be energetically and generously supported at all levels.

Contacts (including movements and exchange of scientific staff) between the universities and national laboratories, scientific government departments, and industry should be vigorously promoted and strengthened. Any one who has a real competency and willingness to participate in university work should be encouraged to do so—so great and urgent is our need that all resources need to be fully exploited. Able and gifted men should be given every opportunity for concentrated and sustained work free from petty worries and distractions. In academic and research establishments the load of administration and of administrators should be cut down to a minimum.

In some of the universities, unfortunately, the 'general climate' is too rigid and resilient to change and innovation. The atmosphere is administration dominated rather than scholarship oriented. In some places even to procure small items of equipment and stores, permission has to be obtained not only of the Head of the Department but also of authorities higher up. Whereas in some of the universities conditions of work are really good, there are other places where young workers are not treated as partners and co-workers. They do not enjoy enough freedom in selecting their research problems. It is of the utmost importance that we create in the universities and research institutions the right atmosphere for learning and research. It is a big and challenging task, and it needs a continuing effort.

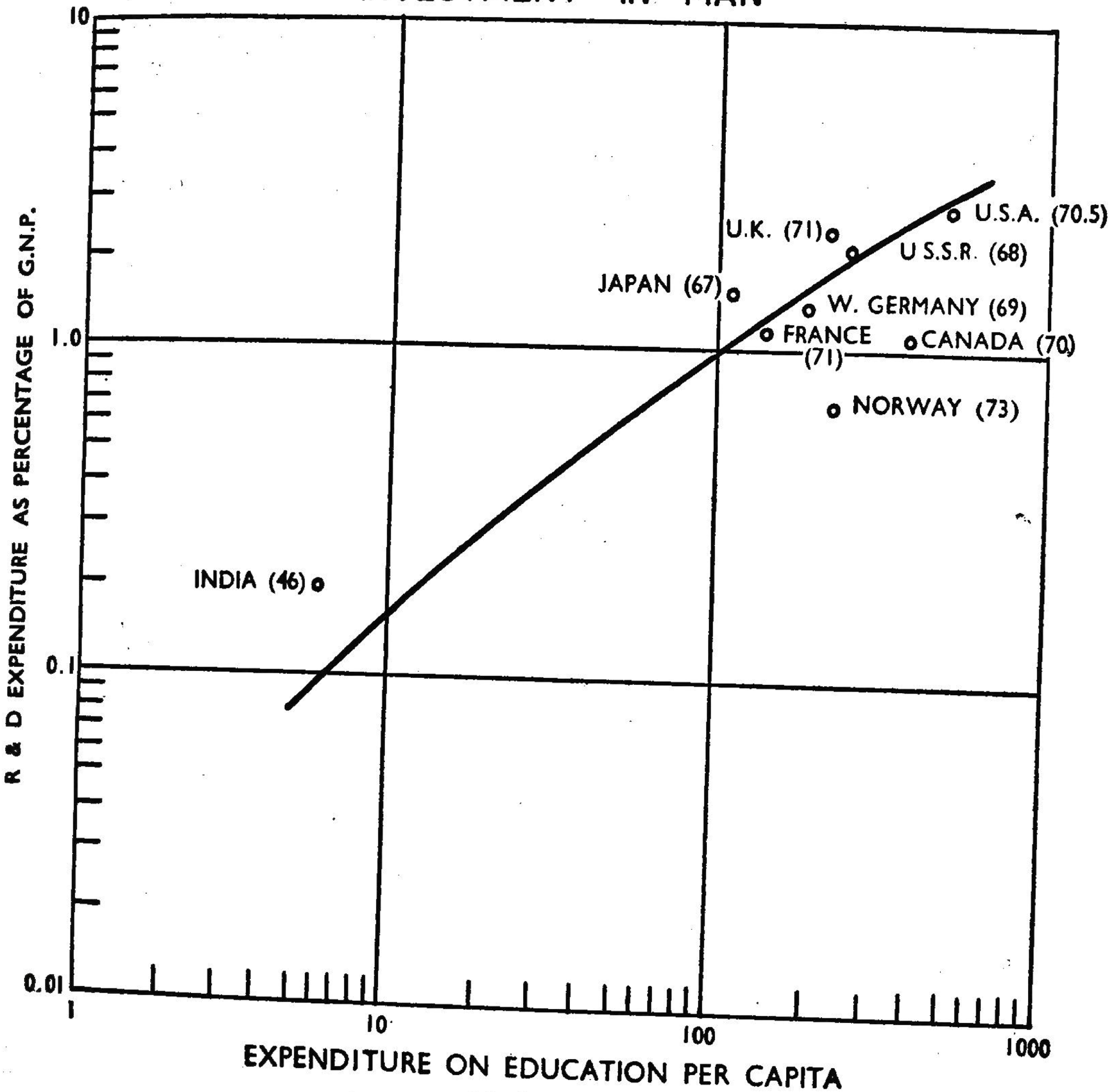
Our resources are limited, so one has to spend more thought to get more out of our resources. And spending thought is more difficult than spending money, specially if it is someone else's money.

The US President's Science Advisory Committee in its recent Report on 'Scientific Progress, the Universities and the Federal Government' (1960) (prepared under the chairmanship of Professor G.T. Seaborg, now Chairman of the Atomic Energy Commission) states: "Both basic research and graduate education must be supported in terms of the welfare of society as a whole. It is in this large sense that the role of the Federal Government is inevitably central. The truth is as simple as it is important: whether the quantity and quality of basic research and graduate education in the United States will be adequate or inadequate depends primarily upon the government of the United States. From this responsibility the Federal Government has no escape. Either it will find the policies—and the resources—which permit our universities to flourish and their duties to be adequately discharged—or no one will."

These are wise and powerful words, and they apply to us no less.

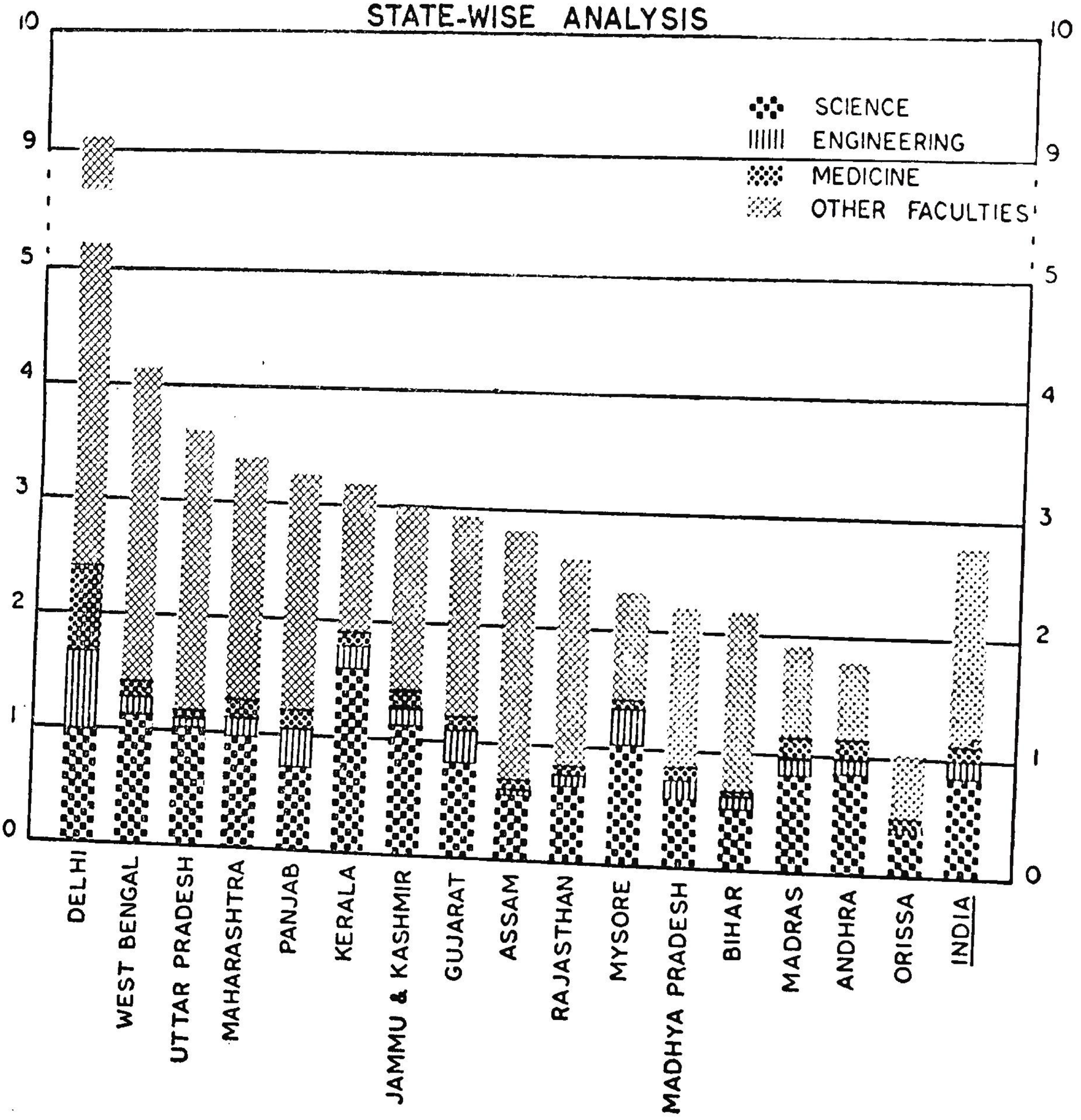
Above all, a university is a dwelling place of ideas and idealism. And the contribution that the universities and colleges will or can make to meet the great challenge of our times will be in direct proportion to their being and becoming, in pursuit of their true ideals, places where there is freedom to enquire boldly and readiness to doubt courageously, where knowledge and understanding and true humility go together and grow more and more, and where the highest standards of scholarship, integrity and conduct are expected, respected and cultivated.

INVESTMENT IN SCIENCE VERSUS INVESTMENT IN MAN



[Numbers in bracket indicate expectancy of life (years) at birth.]

NUMBER OF UNIVERSITY STUDENTS PER THOUSAND OF POPULATION
(INDIA - 1962)
STATE-WISE ANALYSIS



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